WHAT IS CLAIMED IS:

1. A method for volumetric reconstruction of a cyclically moving object using a computed tomography (CT) imaging system, said method comprising:

scanning a cyclically moving object with a CT imaging system including at least one of an area detector and a linear detector to encompass the desired field of view and a rotating gantry to measure projection data during a plurality of cycles of the cyclically moving object;

dividing a period of the cyclically moving object into a discrete number of phases;

identifying an initial set of projection data at a desired phase of a first cycle at a first angle;

identifying at least one subsequent set of projection data at the same desired phase of a subsequent cycle at an angle that is different from the first angle;

combining the initial set of projection data with each subsequent set of identified projection data and using a reconstruction algorithm to generate a three-dimensional image;

repeating said identifying an initial set of projection data at a desired phase of a first cycle at a first angle, identifying at least one subsequent set of projection data at the same desired phase of a subsequent cycle at an angle that is different from the first angle, and combining the initial set of projection data with each subsequent set of identified projection data and using a reconstruction algorithm to generate a collection of three-dimensional images for the desired phases; and

temporally filtering the collection of three-dimensional images on a pixel by pixel basis.

2. A method in accordance with Claim 1 wherein scanning a cyclically moving object with a CT imaging system comprises rotating a gantry such

that 360° relative rotational motion of the gantry corresponds to a single rotation of the gantry.

3. A method in accordance with Claim 1 wherein the cyclically moving object is a patient's heart, and the cycles of the cyclically moving object represent cardiac cycles, wherein dividing a period of the cyclically moving object into a discrete number of phases comprises recording and analyzing an ECG signal that is representative of the patient's cardiac cycle.

4. A method in accordance with Claim 1 wherein scanning a cyclically moving object with a CT imaging system comprises rotating the gantry such that one rotation is completed in one hold-breath of the patient.

5. A method in accordance with Claim 1 wherein scanning a cyclically moving object with a CT imaging system comprises combining a plurality of lower resolution area detectors and a single high-resolution area detector to encompass the desired field of view.

6. A method in accordance with Claim 5 wherein scanning a cyclically moving object with a CT imaging system comprises:

providing a single high-resolution detector positioned such that the field of view of the area detector encompasses the region shadowed by the heart for all view angles; and

providing a plurality of lower resolution detectors positioned such that the field of view of the course area detectors encompasses the area outside the region shadowed by the heart.

7. A method in accordance with Claim 1 further comprising:

forward-projecting data reconstructed from an area outside the region of the cyclically moving object for each view angle position;

subtracting the forward-projected data from a total projection data computed for each view angle position; and

reconstructing the residual data to reduce the reconstruction field of view and minimize artifacts.

8. A method in accordance with Claim 1 wherein scanning a cyclically moving object with a CT imaging system comprises selecting a gantry rotation speed such that one rotation is completed during the data acquisition window.

9. A method in accordance with Claim 1 wherein scanning a cyclically moving object with a CT imaging system comprises selecting a gantry rotation speed such that more than one rotation is completed during a data acquisition window.

10. A method in accordance with Claim 1 wherein scanning a cyclically moving object with a CT imaging system comprises rotating the gantry an angular range to utilize a segment reconstruction technique.

11. A method in accordance with Claim 7 wherein reconstructing the projection data further comprises reconstructing a collection of volumetric images using iterative methods.

12. A method for volumetric reconstruction of a cyclically moving object using a computed tomography (CT) system, said method comprising:

scanning a cyclically moving object with a CT imaging system for one revolution of the CT scanner, wherein the CT imaging system includes at least one detector array and a rotating gantry configured to generate projection data during a plurality of cycles of the cyclically moving object, wherein the cyclically moving object is a patient's heart, and wherein the detector array comprises a plurality of lower resolution detector elements and a single high-resolution area detector positioned such that the high resolution area detector encompasses the region

shadowed by the heart for all view angles and the lower resolution area detectors encompass the area outside the region shadowed by the heart;

dividing a period of the cyclically moving object into a discrete number of phases;

identifying an initial set of projection data at a desired phase of a first cycle at a first angle;

identifying at least one subsequent set of projection data at the same desired phase of a subsequent cycle at an angle that is different from the first angle; and

combining the initial set of projection data with each subsequent set of identified projection data and using a reconstruction algorithm to generate a three-dimensional image, wherein combining the projection data comprises forward projecting reconstructed data from an area outside the reconstructed region of the heart, subtracting the forward projection data from the total projection data generated, reconstructing the residual data to reduce the reconstruction field of view and minimize artifacts;

repeating said identifying an initial set of projection data at a desired phase of a first cycle at a first angle, identifying at least one subsequent set of projection data at the same desired phase of a subsequent cycle at an angle that is different from the first angle, and combining the initial set of projection data with each subsequent set of identified projection data and using a reconstruction algorithm to generate a collection of three-dimensional images for the desired phases; and

temporally filtering the collection of three-dimensional images on a pixel by pixel basis.

13. A computed tomographic (CT) imaging system for imaging a cyclically moving object, said imaging system configured to:

scan a cyclically moving object with a CT imaging system including an at least one of an area detector and a linear detector encompassing the desired field of view and a rotating gantry to generate projection data during a plurality of cycles of the cyclically moving object;

divide a period of the cyclically moving object into a discrete number of phases;

identify an initial set of projection data at a desired phase of a first cycle at a first angle;

identify at least one subsequent set of projection data at the same desired phase of a subsequent cycle at an angle that is different from the first angle; and

combine the initial set of projection data with each subsequent set of identified projection data and using a reconstruction algorithm to generate a three-dimensional image; and

repeat said identifying an initial set of projection data at a desired phase of a first cycle at a first angle, identifying at least one subsequent set of projection data at the same desired phase of a subsequent cycle at an angle that is different from the first angle, and combining the initial set of projection data with each subsequent set of identified projection data and using a reconstruction algorithm to generate a collection of three-dimensional images for the desired phases; and

temporally filter the collection of three-dimensional images on a pixel by pixel basis.

14. A CT imaging system in accordance with Claim 13 wherein to scan a cyclically moving object, said CT imaging system configured to rotate a gantry such that 360° relative rotational motion of the gantry corresponds to a single rotation of the gantry.

15. A CT imaging system in accordance with Claim 13 wherein to scan a cyclically moving object, said CT imaging system configured to select a gantry rotation speed such that more than one rotation is completed during a data acquisition window.

16. A CT imaging system in accordance with Claim 13 wherein the cyclically moving object is a patient's heart, and the cycles of the cyclically moving object represent cardiac cycles, wherein to dividing a period of the cyclically moving object into a discrete number of phases, said system configured to record and analyze an ECG signal that is representative of the patient's cardiac cycle.

17. A CT imaging system in accordance with Claim 13 wherein to scan a cyclically moving object, said CT imaging system configured to rotate the gantry such that one rotation is completed in one hold-breath of the patient.

18. A CT imaging system in accordance with Claim 13 wherein to scan a cyclically moving object, said CT imaging system configured to combine a plurality of lower resolution detectors and a single high-resolution area detector to encompass the desired field of view.

19. A CT imaging system in accordance with Claim 18 wherein to scan a cyclically moving object, said CT imaging system configured to:

position a single high-resolution detector such that the field of view of the area detector encompasses the region shadowed by the heart for all view angles; and

position a plurality of lower resolution detectors such that the field of view of the course area detectors encompasses the area outside the region shadowed by the heart.

20. A CT imaging system in accordance with Claim 13 wherein said CT imaging system further configured to:

forward-project data reconstructed in a region outside the region enclosing the heart for each projection view angle;

subtract the forward-projected data from a total projection data computed for each view angle; and

reconstruct the residual data to reduce the reconstruction field of view and minimize artifacts.

21. A CT imaging system in accordance with Claim 13 wherein scanning a cyclically moving object with a CT imaging system comprises selecting a gantry rotation speed such that one rotation is completed during the data acquisition window.

22. A CT imaging system in accordance with Claim 17 wherein to scan a cyclically moving object, said CT imaging system configured to rotate the gantry an angular range to utilize a segment reconstruction technique.

23. A CT imaging system in accordance with Claim 13 wherein to reconstruct the projection data, said CT imaging system further configured to reconstruct a collection of volumetric images using iterative methods.

24. A computed tomographic (CT) imaging system for imaging a cyclically moving object, said imaging system including at least one detector array and a rotating gantry, and said imaging system configured to:

scan a cyclically moving object with a CT imaging system for one revolution of the CT scanner, wherein the CT imaging system includes at least one detector array and a rotating gantry configured to generate projection data during a plurality of cycles of the cyclically moving object, wherein the cyclically moving object is a patient's heart, and wherein the detector array comprises a plurality of lower resolution detectors and a single high-resolution area detector positioned such that the high resolution area detector encompasses the region shadowed by the heart

for all view angles and the lower resolution area detectors encompass the area outside the region shadowed by the heart;

divide a period of the cyclically moving object into a discrete number of phases;

identify an initial set of projection data at a desired phase of a first cycle at a first angle;

identify at least one subsequent set of projection data at the same desired phase of a subsequent cycle at an angle that is different from the first angle; and

combine the initial set of projection data with each subsequent set of identified projection data and use a reconstruction algorithm to generate a three-dimensional image, wherein combining the projection data comprises forward-projecting reconstructed data from an area outside the region containing the heart, subtracting the forward-projection data from the total projection data, and reconstructing the residual data to reduce the reconstruction field of view and minimize artifacts;

repeat said identifying an initial set of projection data at a desired phase of a first cycle at a first angle, identifying at least one subsequent set of projection data at the same desired phase of a subsequent cycle at an angle that is different from the first angle, and combining the initial set of projection data with each subsequent set of identified projection data and using a reconstruction algorithm to generate a collection of three-dimensional images for the desired phases; and

temporally filter the collection of three-dimensional images on a pixel by pixel basis.